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TLC

for Growing Minds

ATARI®

PROGRAMMING
MANUAL

Volume 3

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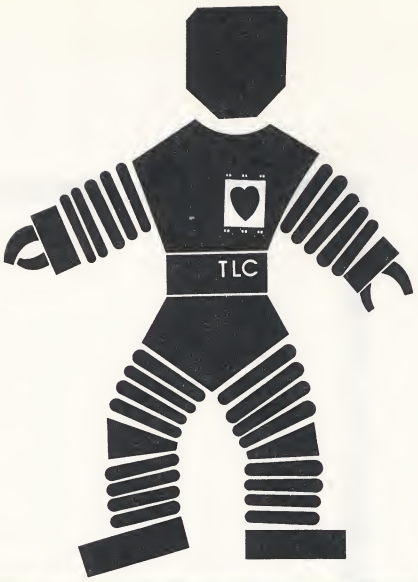

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TLC

ATARI®
PROGRAMMING
MANUAL

for Growing Minds

Volume 3

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ISBN 0-88193-073-3

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Charleston, Illinois 61920

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CHAPTER 1: MAKING DECISIONS

INFORMATION

In many programs you would like the computer to make a decision to follow one set of commands in one case and another set in a different case. To do this, use the IF-THEN command. IF a certain condition is true, THEN the computer will do something. IF the condition is not true, THEN the computer will ignore the direction and go on to the next program line.

ENTER/RUN/OBSERVE

```
10 GR.0
20 A=7
30 IF A=7 THEN GOTO 100
40 END
100 PRINT "A WAS 7!"
```

CHANGE IT/RUN/OBSERVE

Now change line 20 so you can INPUT a number.

```
20 PRINT "CAN YOU GUESS MY NUMBER":INPUT A
```

Notice what happens when you use 7.

CHANGE IT/RUN/OBSERVE

Add this:

```
40 PRINT A;" WAS NOT MY NUMBER."
50 END
```

Notice what happens when you don't use 7.

RUN several times using different numbers.

CHALLENGE

In line 30 change the number to be represented by A. Also change the messages in lines 20, 40 and 100.

ENTER/RUN/OBSERVE

```
10 GR.0
20 PRINT "GUESS MY NUMBER. (BETWEEN 1 AND 10)"
30 INPUT N
40 IF N=5 THEN GOTO 100
50 PRINT "WRONG, GUESS AGAIN!"
60 GOTO 30
100 PRINT "CONGRATULATIONS!!  YOU GOT IT!"
```

Run this program several times, INPUTing different numbers. Then LIST to see how the program works.

CHANGE IT/RUN/OBSERVE

```
*******************************************
* 4Ø IF N=7 THEN 1ØØ                      *
*                                         *
*******************************************
```

When you use the GOTO command in an IF-THEN statement, you can leave out the word GOTO and just use the number.

CHALLENGE

CREATE a program to guess your age. When your program works, get a friend to try it. Make funny answers for guessing too old or too young.

INFORMATION

IF-THEN can also be used with PRINT.

ENTER/RUN/OBSERVE

```
10 GR.0
15 DIM N$(15),S$(3),X$(4)
20 PRINT "WHAT IS YOUR LAST NAME ";
30 INPUT N$
40 PRINT "ARE YOU A FEMALE?  (YES/NO)"
50 INPUT S$
60 PRINT "HELLO ";
70 IF S$="YES" THEN PRINT "MS. ";
80 PRINT N$;" !"
90 END
```

LIST after you RUN this program. Notice why YES gives a different reply from NO.

CHANGE IT/RUN/OBSERVE

```
55 GR.0:PRINT:PRINT:PRINT
```

CHANGE IT/RUN/OBSERVE

Now add these lines to your program:

```
 6Ø
 7Ø IF S$="YES" THEN 1ØØ
 8Ø PRINT "PLEASED TO MEET YOU MR. ";N$
1ØØ PRINT "IS IT MRS. OR MISS?"
11Ø INPUT X$
12Ø GR.Ø
13Ø IF X$="MRS." THEN 2ØØ
135 IF X$="MRS" THEN 2ØØ
14Ø PRINT "DO YOU PREFER TO BE CALLED MISS "
15Ø PRINT "OR MS.?"
16Ø INPUT X$
17Ø PRINT:PRINT "IT HAS BEEN NICE TALKING WITH"
18Ø PRINT "YOU ";X$;" ";N$
19Ø END
2ØØ PRINT "HAVE A NICE DAY MRS. ";N$;".":END
```

RUN this program several times trying different answers. Notice how the different answers are handled. LIST.

CHALLENGE

Write a program that will ask the following question: Who is the most important person in this room?

You decide which answers you will accept to this question and the messages you want printed when other responses are given.

ANOTHER CHALLENGE

Create a 3-question quiz. Use IF-THEN to give responses for acceptable and unacceptable answers.

INFORMATION

Try the following program to see what happens when commands are joined to an IF-THEN statement with a colon.

ENTER/RUN/OBSERVE

```
10 GR.0
15 DIM H$(2),N$(15)
20 PRINT "CAN YOU SPEAK FRENCH? (Y/N)";:
INPUT H$
30 IF H$="Y" OR H$="y" OR H$="YES" THEN
PRINT "AH, BON SOIR. COMMENT T'APPELLE";
:INPUT N$:GOTO 100
40 PRINT "GLAD TC MEET YOU. WHAT'S YOUR
NAME";:INPUT N$
50 PRINT:PRINT "SO LONG FOR NOW, ";N$:END
100 PRINT:PRINT "AU REVOIR, ";N$:END
```

Notice the use of OR in line 30.

CHALLENGE

Change the above program to ask if you speak Spanish or German. Have suitable replies for the possible answers.

INFORMATION

So far in your IF-THEN statements, the computer has been checking to see if a variable equals a particular value.

The computer can also check to see if the variable is more than, less than or not equal to the given value. The symbols for these relationships are:

> is more than

< is less then

>< or <> is not equal to

ENTER/RUN/OBSERVE

```
10 GR.0:PRINT
20 PRINT "GUESS THE NUMBER I'M THINKING OF!"
30 PRINT
40 INPUT N
50 IF N<7 THEN PRINT "YOUR GUESS IS TOO LOW.";
60 IF N>7 THEN PRINT "YOUR GUESS IS TOO
HIGH.";
70 IF N=7 THEN PRINT "CONGRATULATIONS!!  YOU
GOT IT!"
80 IF N=7 THEN END
90 PRINT" GUESS AGAIN":GOTO 30
```

When you run the program on the last page,

try INPUTing numbers other than 7.

CHANGE IT/RUN/OBSERVE

```
65 IF N<>7 THEN PRINT" TRY ANOTHER GUESS."
:GOTO 4Ø

8Ø

9Ø
```

CHALLENGE

Change the program so it can be used to guess

your weight.

ENTER/RUN/OBSERVE

```
10 GR.5
15 COLOR 1
20 IF X=79 THEN X=0:Y=Y+1:C=C+1
30 IF Y=39 THEN END
40 PLOT X,Y
50 X=X+1
60 GOTO 20
```

CHANGE IT/RUN/OBSERVE

```
35 COLOR C
45 IF C > 4 THEN C=1
```

CHALLENGE

Create a program that will produce vertical colored stripes.

INFORMATION

In the examples so far, the numbers you have used have all been whole numbers (integers). But in real life, you use many numbers that are not integers, such as fractional and decimal numbers.

INT(X) will turn a non-integer into an integer.

ENTER/RUN/OBSERVE

```
10 GR.0

20 N=12

30 PRINT N,N/7
```

CHANGE IT/RUN/OBSERVE

```
40 PRINT N, INT(N/7)
```

INFORMATION

The command INT(X) gives only the part to the left of the decimal point. The part to the right of the decimal is dropped. INT(X) does not round a number to the nearest integer, INT(4.99999) = 4. The expression in the parenthesis of the INT command can be a number (5.6, N, etc.) or an operation (5.6/3, 3+X, T*I-1, etc.).

ENTER/RUN/OBSERVE

```
10 N=1/2
20 PRINT N, INT(N)
```

CHANGE IT/RUN/OBSERVE

Add these lines to the above program.

```
 5 GR.0
10 FOR X=0 TO 12
15 N=X/2
30 NEXT X
```

Notice the numbers carefully.

CHANGE IT/RUN/OBSERVE

```
*****************************************
* 1Ø FOR X=-5 TO 5                      *
*                                       *
*****************************************
```

Notice how the negative X-values become even smaller numbers after INT. INT(X) reduces each number to the next lowest integer.

CHALLENGE

Suppose you own a construction company and it takes you and your workers 1.25 months to build a house.

Write a program that will calculate the number of complete houses that have been built by a) March, b) July, c) October, and d) December, assuming you start work on January 1st. Have the program allow you to INPUT the number of months worked.

ENTER/RUN/OBSERVE

```
10 GR.0
20 FOR N=1 TO 15
30 PRINT N,
40 IF N/2=INT(N/2) THEN PRINT "THIS NUMBER
IS EVEN"
50 IF N/2 <>INT(N/2) THEN PRINT "THIS NUMBER
IS ODD"
60 NEXT N
```

CHANGE IT/RUN/OBSERVE

```
55 IF N/5=INT(N/5) THEN PRINT N;" IS A
MULTIPLE OF 5"
```

CHALLENGE

Write a program that will print the multiples of 9 from 0 to 99 using INT(X) and IF-THEN.

REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	This command requires the computer to make a decision. It does one thing if the condition is true, and something else if it is not.
	This command turns numbers into integers by eliminating all numerals to the right of the decimal point.

CHAPTER 2: MAKING CHANGES

INFORMATION

With longer programs and more complicated program lines, it becomes necessary to retype lines more often. Editing is making changes in the lines after they have been entered. Type in the program below without correcting the mistakes. Press the Caps/Lower key to get the lower case letters.

ENTER/RUN/OBSERVE

```
10 GR.0
20 PRINT "Using small case latters is"
30 PRINT "very asy wath the Caps/Lower"
40 PRINTT "key.  However, all program"
50 PRNT "commands must be in captal"
60 PRINT "letterss."
```

When you type in lines 40 and 50, the computer will immediately tell you that there is an error. But, let's fix line 20 first.

1. List the whole program. Notice that some of the errors are marked.
2. Hold down the CTRL key.

3. Use the arrow keys near the [RETURN] key to move the cursor to the "a" in latters in line 2Ø.
4. Type the [E] key.
5. Press [RETURN].
6. Using the [CTRL] and arrow keys, move the cursor to the end of the listing.

That's all! It's fixed!

Change the "a" in wath to an "i".

In line 6Ø you are going to delete the extra s in "letterss".

1. Position the cursor using the [CTRL] key and the arrows over one of the s's in "letterss".
2. While holding the [CTRL] key, press the [DELETE BACK S] key. Notice how the whole line moves over.
3. Press [RETURN] and move out of the listing.

Notice in line 4Ø that the computer has already marked the error with a reverse character.

1. Move the cursor over the [E] in ERROR. It is important that you delete the error message as well as the actual mistake.
2. Press the [DELETE BACK S] key while holding the [CTRL] several times until the cursor is over the P in PRINTT.
3. Move over and erase the extra T.
4. Notice that there is a reverse character over the first quotation mark. You can never leave a reverse character in the line so type over it.
5. Press [RETURN] and exit the listing.

Inserting letters is very similar to deleting them. Let's correct line 3Ø first.

1. Move the cursor over the "a" in asy.
2. Hold down the [CTRL] key and press the [INSERT] key. The line will move over one space.
3. Type an "e".
4. Press [RETURN] and exit the listing.

In line 5Ø first the error message must be deleted and then an "I" inserted in the word PRNT. Remember not to leave any reverse characters. Try this one on your own.

Insert an "i" in the word "captal" and correct any other mistakes until the program runs smoothly.

Editing saves time and energy so use it often!

CHALLENGE

Correct all the errors in the program below so that it will RUN.

```
10 GR.O
20 PRINT " GOOD THINGS come easily!"
30 PRINT " Isn't that soo!"
40 PRINT GOTO 3O
```

REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	This key must be pressed when editing to allow cursor movement.
	This set of four keys is used to position the cursor when editing.
	While holding down the CTRL key, pressing this key moves the line over and allows you to add characters.
	While holding down the CTRL key, pressing this key erases characters in a line.

CHAPTER 3: RANDOM CAN ADD THE UNEXPECTED

INFORMATION

The computer can be used to randomly select a number or word. The command that does this is RND.

ENTER/RUN/OBSERVE

```
10 PRINT RND(1)
```

RUN this several times and note the number that is displayed.

CHANGE IT/RUN/OBSERVE

```
 5 FOR T=1 TO 10
15 NEXT T
```

Run the program several times.

CHANGE IT/RUN/OBSERVE

```
10 N=RND(1)
13 PRINT N,10*N
```

Well, at least they're not decimals anymore! But you probably need integers. Ah ha! Another use for the INT(X) command.

CHANGE IT/RUN/OBSERVE

```
*****************************************
* 13 PRINT N, INT(1Ø*N)                 *
*                                       *
*****************************************
```

Now you have a random set of numbers from Ø-9. The secret to the range of numbers is quite easy once you get the hang of it. Notice that in the above example you multiplied by 1Ø and got random numbers from Ø-9. Therefore, if you multiply by 2Ø, you would get a random assortment from Ø-19. If you want the range to be from 1 to 1ØØ, multiply by 1ØØ and add 1.

CHALLENGE

Create a program that will print ten random integers that fall between Ø and 1ØØ.

Edit the program so that the ten numbers are all between Ø and 32.

INFORMATION

Random events such as the rolling of a die can be programmed.

ENTER/RUN/OBSERVE

To represent the rolling of a six-sided die, try this:

```
10 GR.0
20 FOR T=0 TO 5
30 R=INT(6*RND(1))+1
40 PRINT T, R
50 NEXT T
```

RUN this several times.

CHANGE IT/RUN/OBSERVE

To keep track of how often each number is selected, add these lines:

```
31 IF R=1 THEN A=A+1
32 IF R=2 THEN B=B+1
33 IF R=3 THEN C=C+1
34 IF R=4 THEN D=D+1
35 IF R=5 THEN E=E+1
36 IF R=6 THEN F=F+1
(program continued)
```

```
* 6Ø PRINT A,B,C,D,E,F                    *
*                                         *
*******************************************
```

Edit line 2Ø to represent more throws. Try 5Ø, 1ØØ, and 5ØØ. Notice how many times each number is selected. RUN it several times using 5ØØ and record the values of A,B,C,D,E,F. (Or alter your program so the computer will do it for you!)

CHALLENGE

In some games, such as Dungeons and Dragons, many-sided dice are used. Create a program that will represent the roll of an eight-sided die. Remember there is no zero.

Now edit it to produce five rolls of a ten-sided die. Label each dice roll and dress up your program.

INFORMATION

Random can also be used with graphics.

ENTER/RUN/OBSERVE

```
10 GR.5
20 X=79*RND(1)
30 Y=39*RND(1)
40 COLOR 1
60 PLOT X,Y
70 GOTO 20
```

CHANGE IT/RUN/OBSERVE

To make the color random, make these changes.

```
40 C=4*RND(1)
50 COLOR C
```

CHANGE IT/RUN/OBSERVE

Add this.

```
15 PLOT 40,20
60 DRAWTO X,Y
```

CHALLENGE

Alter the preceding program so that all the PLOTing and DRAWTOing will take place only on the left half of the screen.

INFORMATION

The computer uses numbers to represent the letters and characters it displays on the screen. It also uses numbers to represent actions, such as sounding the buzzer, returning to the left of the screen, and clearing the screen.

By providing the right number, you can get the action you want.

ENTER/RUN/OBSERVE

First, to see a small ball, try this:

```
10 PRINT CHR$(20);
```

CHANGE IT/RUN/OBSERVE

```
 5 FOR T=1 TO 27
15 NEXT T
```

CHANGE IT/RUN/OBSERVE

Make these changes:

```
*********************************************
*                                           *
*   3 INPUT X                               *
*                                           *
*  1Ø PRINT CHR$(X);                        *
*                                           *
*********************************************
```

Now you can select a number and see what a whole line of the corresponding symbol looks like.

Try the following values:

123
128
96

CHALLENGE

Change the above program so that it will return to line 3. This will allow you to display your choice of the possible values of X for CHR$(X) without entering RUN so often.

INFORMATION

By placing the last program in a FOR-NEXT loop, you can see all the symbols from Ø to 255, before repeating.

ENTER/RUN/OBSERVE

To see this list of all the CHR$ numbers and their corresponding symbols, enter:

```
10 GR.0
20 FOR X=0 TO 255
30 PRINT X,CHR$(X)
40 FOR T=1 TO 50:NEXT T
50 NEXT X
```

CHALLENGE

Using one of the graphic characters, draw a horizontal line across the screen. Then have the buzzer sound five times.

ENTER/RUN/OBSERVE

```
10 GR.0
20 DIM A(5)
25 A(1)=72
30 A(2)=69
35 A(3)=76
40 A(4)=76
45 A(5)=79
50 FOR X=1 TO 5
60 PRINT CHR$(A(X));
70 NEXT X
```

CHANGE IT/RUN/OBSERVE

```
25 A(1)=65
30 A(2)=69
35 A(3)=84
40 A(4)=82
45
55 N=INT(4*RND(1))+1
60 PRINT CHR$(A(N));
75 PRINT
80 GOTO 50
```

Notice how often it forms a word you know.

CHALLENGE

Increase the size of the array to hold 12 letters. But only randomly print three letter words.

REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	This command generates a random number between Ø and 1, including Ø.
	This command prints characters or letters on the screen, depending on the number you use with it.

CHAPTER 4: UNUSED MEMORY AND MAKING MUSIC

INFORMATION

It is possible to find out the amount of unused memory remaining in the computer by using the FRE(X) command. This can be very handy to know when you're writing long programs and you want to know how much memory you have left.

ENTER/RUN/OBSERVE

```
*****************************************
*                                       *
* PRINT FRE(X)                          *
*                                       *
*****************************************
```

This gives a number that is related to the unused memory.

Record the number you get when there is no program in the memory. Call this number A.

Now enter a short program into your computer.

RUN the program.

Again, enter:

```
*****************************************
*                                       *
* PRINT FRE(X)                          *
*                                       *
*****************************************
```

Call this number B. How does B compare with A?

CHALLENGE

Create a program that allows you to INPUT ten numbers. Have the program show the number on the screen if it is a multiple of three. Let the last number that is shown be the amount of memory used.

INFORMATION

The Atari has the ability to make music. You can teach it songs and it can play them back.

ENTER/RUN/OBSERVE

```
10 GR.0
20 SOUND 0,121,10,8
30 FOR T=1 TO 500:NEXT T
40 SOUND 0,0,0,0
```

CHANGE IT/RUN/OBSERVE

First change the pitch (the second number).

```
20 SOUND 0,54,10,8
```

CHANGE IT/RUN/OBSERVE

To do things the easy way,

```
15 INPUT X
20 SOUND 0,X,10,8
50 GOTO 15
```

Try a lot of different pitches.

CHANGE IT/RUN/OBSERVE

Now change the volume (the last number).

```
15 FOR V=1 TO 15
2Ø SOUND Ø,121,1Ø,V
5Ø NEXT V
```

What do you think V does?

CHANGE IT/RUN/OBSERVE

The third number is called the distortion number. When it is 1Ø, a clear note is produced. Try this.

```
15 FOR D=1 TO 15
2Ø SOUND Ø,121,D,8
25 PRINT D
5Ø NEXT D
```

CHALLENGE

Create a short program that produces five different sounds. The chart on the next page may be helpful.

	PITCH	NUMBER
HIGH NOTES	C	29
	B	31
	A# or B♭	33
	A	35
	G# or A♭	37
	G	40
	F# or G♭	42
	F	45
	E	47
	D# or E♭	50
	D	53
	C# or D♭	57
	C	60
	B	64
	A# or B♭	68
	A	72
	G# or A♭	76
	G	81
	F# or G♭	85
	F	91
	E	96
	D# or E♭	102
	D	108
	C# or D♭	114
MIDDLE C	C	121
	B	128
	A# or B♭	136
	A	144
	G# or A♭	153
	G	162
	F# or G♭	173
	F	182
LOW NOTES	D	193
	D# or B♭	204
	D	217
	C# or D♭	230
	C	243

INFORMATION

The Atari can produce up to four sounds at once.

ENTER/RUN/OBSERVE

```
10 GR.0
20 SOUND 0,121,10,8
30 SOUND 1,91,10,8
40 SOUND 2,81,10,8
50 SOUND 3,60,10,8
60 FOR T=1 TO 500:NEXT T
```

Notice that the first number selects which of the four voices to use: 0 to 3.

CHANGE IT/RUN/OBSERVE

Add these lines.

```
15 X=1
20 FOR S=0 TO 3
30 SOUND S,(60*X)+(20*S),10,8
40 NEXT S
50 X=0
70 GOTO 20
```

Can you stop the sound?
LIST. Study line 30 carefully.

CHANGE IT/RUN/OBSERVE

```
15 FOR X=1 TO Ø STEP -1
7Ø NEXT X
```

ENTER/RUN/OBSERVE

Now clear the memory and enter this program.

```
1Ø SOUND Ø,121,1Ø,5
2Ø SOUND 1,96,1Ø,5
3Ø SOUND 2,81,1Ø,5
4Ø FOR T=1 TO 1ØØØ:NEXT T
5Ø FOR T=Ø TO 2:SOUND T,Ø,Ø,Ø:NEXT T
```

Experiment as you like with the different voices. Notice that line 5Ø easily turns all of the notes off.

ENTER/RUN/OBSERVE

```
1Ø PRINT "INPUT A PITCH (29-243)"
2Ø PRINT "TYPE Ø TO END";:INPUT P
3Ø SOUND Ø,P,1Ø,5
4Ø GOTO 1Ø
```

ENTER/RUN/OBSERVE

Clear the memory and enter this program.

```
  4 A=1
  5 N=18Ø
 1Ø GRAPHICS Ø
 2Ø SOUND Ø,96,1Ø,8
 4Ø FOR T=1 TO N:NEXT T
 5Ø SOUND Ø,1Ø8,1Ø,8
 6Ø FOR T=1 TO N:NEXT T
 7Ø SOUND Ø,121,1Ø,8
 9Ø FOR T=1 TO N:NEXT T
1ØØ SOUND Ø,1Ø8,1Ø,8
12Ø FOR T=1 TO N:NEXT T
13Ø SOUND Ø,96,1Ø,8
15Ø FOR T=1 TO N:NEXT T
155 SOUND Ø,Ø,1Ø,8
156 FOR T=1 TO A:NEXT T
16Ø SOUND Ø,96,1Ø,8
18Ø FOR T=1 TO N:NEXT T
185 SOUND Ø,Ø,1Ø,8
187 FOR S=1 TO A:NEXT S
2ØØ SOUND Ø,96,1Ø,8
22Ø FOR T=1 TO N:NEXT T
```

Study the program carefully. RUN it several times.

CHANGE IT/RUN/OBSERVE

Now add these lines.

```
 3Ø SOUND 1,81,1Ø,8
 55 SOUND 1,91,1Ø,8
 8Ø SOUND 1,96,1Ø,8
11Ø SOUND 1,91,1Ø,8
14Ø SOUND 1,81,1Ø,8
154 SOUND 1,Ø,1Ø,8
17Ø SOUND 1,81,1Ø,8
186 SOUND 1,Ø,1Ø,8
21Ø SOUND 1,81,1Ø,8
```

CHALLENGE

Create a short song with the SOUND command.

REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	This command produces a note for voice (S) of pitch (P) with volume (V) and distortion value (D).
	This command turns off a note.
	This tells how much usable memory is left in the computer.

REFERENCE

COMMAND/KEY	FUNCTION
	This set of four keys is used to position the cursor when editing.
CTRL	This key must be pressed when editing to allow cursor movement.
DELETE BACK S	While holding down the CTRL key, pressing this key erases characters in a line.
FRE(X)	This tells how much usable memory is left in the computer.
IF-THEN	This command requires the computer to make a decision. It does one thing if the condition is true, and something else if it is not.
INSERT	While holding down the CTRL key, pressing this key moves the line over and allows you to add characters.
INT(X)	This command turns numbers into integers by eliminating all numerals to the right of the decimal point.
PRINT CHR$(X)	This command prints characters or letters on the screen, depending on the number you use with it.

CONGRATULATIONS!!!

You have now finished the yellow instructional level of TLC FOR GROWING MINDS and have a good working vocabulary of BASIC commands.

You are now ready to work the YELLOW projects in the Intermediate TLC Project Book. They will teach you new uses for the commands you have learned and help you gain experience using these commands. When you have finished the YELLOW projects, Volume 4 (GREEN) of TLC FOR GROWING MINDS will help you to continue learning.

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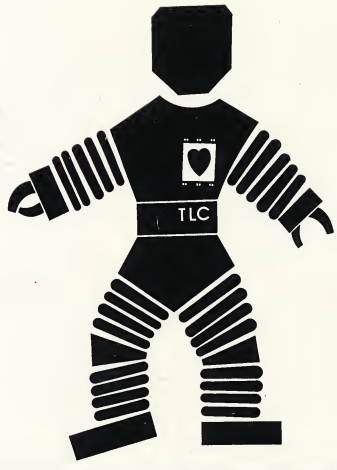

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ATA-R-3

ISBN 0-88193-073-3